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(54) GRAPHITE HEATING AND/OR SUPPORT ELEMENT

(71) We, SCHUNK & EBE GMBH, a German body corporate of 63, Giessen, (Hessen), Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method for the epitaxy of silicon wherein a graphite heating and/or support element is employed. These elements must meet high requirements in regard to purity.

It is known to provide graphite heating and/or support elements with a silicon carbide coating. However, such a coating is of insufficient density to be able to prevent the diffusion of impurities from the graphite into the silicon wafers. In order that such coatings may nevertheless be employed, it is necessary to increase the diffusion path, i.e. to apply coatings of a considerable thickness, i.e. of at least 0.5 to 1 mm. In this way, it is possible to keep the silicon wafers substantially free from impurities from the graphite. However, the coating has the disadvantage that it does not adhere well to the substrate, because displacements occur owing to the differing heat expansions of graphite and silicon carbide, and the thick coating cannot follow these displacements owing to its rigid structure. Therefore, microcracks occur even after a few heatings and render the support element unserviceable, because impurities may pass from the graphite to the silicon wafers through these cracks. In the extreme case, the silicon carbide coating may even be detached from the substrate.

It is the object of the invention to provide a graphite heating and/or support element for the epitaxy of silicon, which is provided with a coating which permanently prevents impurities from leaving the graphite and firmly adheres to the graphite substrate.

The invention provides a method for the epitaxy of silicon wherein a heating and/or support element is used which comprises a graphite substrate the surface of which is provided with a dense pyrolytically deposited carbon coating.

The pyrolyticaly deposited carbon may be either a hard-carbon coating or a pyrographite coating; both coatings are free from impurities owing to the pyrolytic deposition, and even in thicknesses of 5 to 50 μm they prevent the diffusion of impurities from the graphite substrate and are firmly united without cracking to the substrate, whereby satisfactory operation is ensured over a long period of use.

The silicon carbide coating which is thereafter optionally applied to prevent reactions between the carbon and the silicon need be only a few μm thick; in this thickness it adheres firmly to the substrate and exhibits no tendency to form microcracks, since it is elastic owing to its small thickness and follows the displacement caused by differing thermal expansion coefficients.

British Patent Specification No. 983 322 describes a process which is similar to the method described and claimed in this specification.

WHAT WE CLAIM IS:—

1. A method for the epitaxy of silicon wherein a heating and/or support element is used comprising a graphite substrate the surface of which is provided with a dense pyrolytically deposited carbon coating.

2. A method according to claim 1 wherein the carbon coating is hard carbon.

3. A method according to claim 1 wherein the carbon coating is pyrographite.

4. A method according to any one of claims 1 to 3, wherein the carbon coating is 5 to 50 μm thick.

5. A method according to any one of claims 1 to 4, wherein a silicon carbide coating is additionally applied to the dense carbon coating.

6. A method for the epitaxy of silicon wherein heating and/or support element is used substantially as herein described.

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